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## The role of phase transitions in triggering the emergence of collective intelligence in human groups: an experimental investigation

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Human groups face with problem-solving through autonomous and self-organized processes of collective decision-making. Among scientists, statistical physicists have studied large collective systems in nature (make examples) and, in particular, how the dynamics of collective decision-making affect the overall performance of the system. At the local scale, repeated and non-linear interactions among the system's components (the individuals in the group) trigger the emergence of new and unpredicted patterns at the global scale (the group), where non-linear phenomena like phase transitions, bifurcations, scaling, and self-organization have been observed. In the context of human groups, the emergence of Collective Intelligence (CI) explains why groups manifest abilities of problem solving higher than those characterizing its individual members. Recently, the dynamics of group decision-making has been modelled through a combined process of consensus-seeking and individual search for high-performing solutions on the problem space. The correspondent numerical simulations have proven that groups undergo a critical phase transition from low to high performance, depending on the strength of social interactions among the agents and the level of self-confidence the individuals have about their knowledge of the problem. While social interactions strengthen the mechanism of consensus-seeking within the group, the level of self-confidence drives the agents towards effective exploration of the problem space. Here, we provide empirical evidence for these results. We performed behavioural experiments of group decision-making to assess whether and how the strength of social interactions among the agents in the group influence group performance during problem-solving. The empirical results confirm that social interactions influence the dynamics of group decision-making in real human groups. We found that a critical level of the strength of social interaction, equal to that predicted by numerical simulations, triggers a phase transition from low to high values on the level of consensus among the agents in the group and a similar steep increase on the group performance.

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